Department of Mechanical and Industrial Engineering, College of Engineering

MEEN 4301 DESIGN OF AEROSPACE STRUCTURES

FALL 2025, 3 SCH, IN-PERSON

LECTURE: MWF, 11 to 11:50 AM, ENGC 138

Instructor:	**Prof. Larry D. Peel, PhD PE**
Office Location:	Engineering Complex 263
Face-to-Face Student Support Hours:	MW 10-11 am, TR 9-10 am, T 2-4 pm
Office Phone:	361-593-2292
University Email Address:	Larry.peel@tamuk.edu
Course Mode of Instruction:	Face-to-Face
Preferred Form of Communication:	Email or Face-to-face

COURSE DESCRIPTION

MEEN 4301 Design of Aerospace Structures 3 (0)

Advanced strength of materials analysis and design of light-weight elastic structures with aerospace applications. Failure modes and criteria, buckling, matrix methods for analysis, plane truss design. Energy and Castigliano methods for statically determinate and indeterminate structures. Torsion and bending of asymmetrical thin-walled sections. Design project. Prerequisites: senior standing in Mechanical Engineering and credit or enrollment in MEEN 3360.

TEXTBOOK INFORMATION

Textbook(s) Required: T.A. Weisshaar. Aerospace Structures – an Introduction to Fundamental Problems, Purdue University Course Notes, 2011. https://pdfcoffee.com/aae-352-course-text-weisshaar-2011-pdf-free.html, free to download pdf.

Textbook(s) Required: Beer, D., McMurrey, D., A Guide to Writing as an Engineer, Wiley, 3rd ed or newer, 2009, e-book okay.

Reference: Eric. R. Johnson, Aerospace Structures, Virginia Tech Publishing, vtechworks.lib.vt.edu/handle/10919/102306, Open Textbook, 1st Ed, 2022

STUDENT LEARNER OUTCOMES

Upon successful completion of this course, students will be able to:	**Core Curriculum Alignment**
1. Understand and use a wide range of aerospace engineering terms, both aviation and space related.	Communication
2. Classify an air vehicle and major components into types of structure.	Critical Thinking
3. Determine the types of loading that an aerospace structure can undergo.	Critical Thinking
4. Understand mechanical properties & densities of metals, wood, composites, and polymers to make suitable selections for space, aeronautical, and micro-air vehicles.	Critical Thinking
5. Conduct strength of materials and design of light-weight aerospace vehicles, given loads and flight conditions.	Empirical & Quantitative Skills

6. Reduce the weight of a poorly designed aerospace structure with a fixed shape, while maintaining or improving mechanical performance.	Critical Thinking, Empirical & Quantitative Skills
7. Research concepts and processes needed to achieve poorly defined objectives while iterating on designs and analyses.	Critical Thinking, Empirical & Quantitative Skills
8. Clearly document and present their work as a team.	Communication, Teamwork
9. Explore their future career path: Worker Bee, Researcher, Influencer, Manager, or Documenter	Personal Responsibility, Critical Thinking, Communication

MARKETABLE SKILLS

Graduates can design and conduct structural analysis for a specific aerospace structure or UAV. They are familiar with multiple aerospace structure types, can research necessary concepts, materials, and processes, and can design components using cost-effective, lightweight materials.

COURSE ASSIGNMENTS & ASSESSMENT

All assignments, project presentations and reports, quizzes will be submitted on Blackboard, 2 exams will be taken on paper.

COMMUNITY SERVICE-LEARNING EXTRA CREDUT

Community service learning can be used to get a 2% extra on final grade, Four hours minimum. I prefer the service learning to be somewhat engineering oriented. Must be community-based, ie Boys & Girls Club, food banks, see JustServe.org, must get pre-approved through Blackboard. See me for details.

GRADING

1)	Homework & Group assignments:	30 %	A – 90%
2)	Quizzes & Attendance (10%)	10 %	B – 80%
3)	2 exams (20 each)	40 %	C – 70%
4)	Group-based Final Research Project	20%	D – 60%, F < 59.51%

UNDERGRADUATE RESEARCH/FINAL PROJECT COMPONENTS

From the Council on Undergraduate Research and Google: Undergraduate research is "A mentored investigation or creative inquiry conducted by undergraduates that seeks to make a scholarly or artistic contribution to knowledge". Fixed wing micro air vehicles are increasingly used for surveillance, mapping, agricultural sensing, and aerial photography. For this course we will attempt to answer the multi-part question of how lightweight can an appropriately designed and fabricated tube-launched micro air vehicle be to glide for at least 5 minutes? Can it fly for longer times? Besides final presentations, where else can the project be presented? As part of the project, you will be using the DEC Makerspace in the library. In it, students can earn Digital Badges in: (a) 3D Printing, (b) 3D Scanning, (c) Embroidery Digitizing/Machine Operation, (d) Laser Cutting/Engraving, (e) Podcasting/AV Editing, (f) Vinyl Cutting/Machine Operation. Digital Badges provide employers with proof that you have utilized specialized equipment and have acquired specific marketable skills.

*First **Day Notes and Assignment***

1) *Get familiar with the course on Blackboard.*
2) *Download the textbook.*
3) *Learn about undergraduate research vs a regular course*

*First Essay Homework Assignment (to be typed and **copied on to Blackboard** (no pictures needed, just include text, with references).*

a) *Go on to Blackboard and review the material posted there, then download the textbook.*

b) Submit an initial Blackboard assignment on what you want out of the class, what special topics you want to learn about and what type of aerospace structures that you are most interested in, etc.

All emails to me, relating to this course to must include "MEEN 4301" in the subject line.

Tentative Topics (not in order):

1. Presentation of the development, fabrication, and testing of the Conformal Integrated Sheet Actuator Wing System (CISAWS-1) at AFRL by Peel & Lopez.
2. Overview of the fabrication and testing of Rocket plane X-34
3. Discussion, quizzes on aerospace terminology.
4. Discussion of typical aerospace materials and their properties, including strength-to-weight ratios and stiffness-to-weight ratios.
5. Discussion of typical UAV/Drone designs and structures, benefits of each.
6. Discussion of typical manned aircraft structures, and benefits of each type of configuration
7. Discussion of typical rockets and spacecraft structures, including satellites and interplanetary vehicles.
8. Introduction to the Experimental Aircraft Association and helps for those who build their own airplanes
9. Discussion of wooden aircraft, benefits, disadvantages, usefulness for UAVs, etc.
10. Weisshaar – Chapter 2 – A review of statics and mechanics of simple structures
11. Weisshaar - Chapter 3 – Inertia Loads
12. Weisshaar - Chapter 4 - Matrix Methods
13. Weisshaar - Chapter 5 -–Materials and Processes
14. Weisshaar - Chapter 6 - A review of Beamology-Bending and shear stresses in classical beams
15. Weisshaar - Chapter 7 Reinforced, Thin-walled Wing & Fuselage Structure Idealizations
16. Weisshaar – Chapter 8 – Stability (just discuss)
17. Final Project Fabrication
18. Guest speakers
19. Local tours to see aircraft under construction, other tours to SpaceX, the United Launch Alliance, and CCAD, if allowed.

COURSE AND UNIVERSITY PROCEDURES/POLICIES

INSTRUCTOR'S POLICIES

Attendance

Will follow Student Handbook. Attendance will be taken at each lecture. If you miss four or more unexcused lectures I may drop you from the course, or drop your grade. **Students missing 6 or more unexcused lectures will be dropped from course, or dropped a letter grade, no exceptions. Excused absences should be kept to a minimum.**

Late/Missing Work/Extra Credit

No late work, unless pre-approved or under special circumstances (illness, car wreck, hurricane, etc).

Use of AI in the Classroom

You are not allowed to use any AI (Such as ChatGPT) for any essay response on any exam question, or pop quiz. You can use an AI to help you create and format your reports, but each time that you use an AI with must be referenced with the name of the AI package, date, person using the AI. In the Lessons Learned or Conclusions section, you must state whether or not the AI helped you. Not allowed anywhere else without written permission from Prof. Peel. Any use outside of this permission will be considered a violation of the University's academic misconduct policy and may lead to disciplinary procedures.

Other

HONESTY: All homework, tests, reports must be your own. You are allowed and *encouraged* to study with others, but copying homework or cheating of any kind on tests is grounds for immediate dismissal from the course and perhaps the university.

Quizzes: Quizzes, based on the current assignment or attendance will be given randomly.

Incentive: All students who attend every lecture & attempt all homework problems & projects, handing them in on time, will be given 2% extra to their final grade.

Final Project: The final project will be the design and fabrication of a tube-launched micro-air vehicle glider. The project will be completed by a team. Part of the project will be to document your design, fabrication and flight results in a report and present them. You will work on the final project during most of the semester, rather than starting at the end.

UNIVERSITY POLICIES

Six Drop Policy

The following provision does not apply to students with Texas public college or university credits prior to Fall 2007. The Texas Senate Bill 1231 specifies the number of course drops allowed to a student without penalty. After a student has dropped six courses, a grade of QF will normally be recorded for each subsequent drop. Additional information on Senate Bill 1231 is available at the Registrar's Office at (361) 593-2811 and at Academic Procedure: Drop Policy.

Students with Disabilities

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodations of their disability. If you believe you have a disability requiring an accommodation, please contact the Disability Resource Center (DRC) as early as possible in the term at (361) 593-3024. DRC is located in the Student Health and Wellness building at 1210 N. Retama St.

Classroom Conduct Expectations

Students are referred to the *Student Code of Conduct* section of the Student Handbook. Students are expected to assume individual responsibility for maintaining a productive learning environment and conduct themselves with the highest regard for response and consideration of others. Ongoing or single behaviors considered distracting will be addressed by the faculty member initially, but if the behavior becomes excessive and the student refuses to respond to the faculty member's efforts, the issue will be referred to the Dean of Students. In the case of serious disruptive behavior in a classroom, the instructor will first request compliance from the student and if the student fails to comply, the instructor has the authority to ask the student to leave the classroom. The student is expected to comply with the instructor's request and may subsequently contest this action using procedures established by the department. If the student fails to leave after being directed to do so, assistance may be obtained from other university personnel, including the University Police Department. The incident shall be handled as an academic misconduct matter using established departmental procedures for academic misconduct to determine if the student should be allowed to return to the classroom.

Academic Misconduct

Students are expected to adhere to the highest academic standards of behavior and personal conduct in this course and all other courses. Students who engage in academic misconduct are subject to University disciplinary procedures. Student are expected to be familiar with the current Student Handbook, especially the section on academic misconduct, which discusses conduct expectations and academic dishonesty rules. Academic dishonesty includes but is not limited to:

1. Cheating: deception in which the student misrepresents that he/she has mastered information on an academic exercise that he/she has not mastered; giving or receiving aid unauthorized by the professor on assignments or examinations.
2. Aid of academic dishonesty: Intentionally facilitating any act of academic dishonesty. Tampering with grades or taking part in obtaining or distributing any part of a scheduled test.
3. Fabrication: use of invented information or falsified research.
4. Plagiarism: unacknowledged quotation, and/or paraphrase of someone else's work, ideas, or data as one's own in work submitted for credit. Failure to identify information or essays from the internet and submitting them as one's own work also constitutes plagiarism. Please be aware that the University subscribes to the Turnitin plagiarism detection service. Your paper may be submitted to this service at the discretion of the instructor.

5. Lying: deliberate falsification with the intent to deceive in written or verbal form as it applies to an academic submission.
6. Bribery: providing, offering or taking rewards in exchange for a grade, an assignment, or the aid of academic dishonesty.
7. Threat: an attempt to intimidate a student, staff or faculty member for the purpose of receiving an unearned grade or in an effort to prevent reporting of an Honor Code violation.

Other forms of academic misconduct included but are not limited to:

1. Failure to follow published departmental guidelines, professor's syllabi, and other posted academic policies in place for the orderly and efficient instruction of classes, including laboratories, and use of academic resource or equipment.
2. Unauthorized possession of examinations, reserved library materials, laboratory materials or other course related materials.
3. Failure to follow the instructor or proctor's test-taking instructions, including but not limited to not setting aside notes, books or study guides while the test is in progress, failing to sit in designated locations and/or leaving the classroom/test site without permission during a test.
4. Prevention of the convening, continuation or orderly conduct of any class, lab or class activity. Engaging in conduct that interferes with or disrupts university teaching, research or class activities such as making loud and distracting noises, repeatedly answering cell phones/text messaging or allowing pagers to beep, exhibiting erratic or irrational behavior, persisting in speaking without being recognized, repeatedly leaving and entering the classroom or test site without authorization, and making physical threats or verbal insults to the faculty member, or other students and staff.
5. Falsification of student transcript or other academic records; or unauthorized access to academic computer records.
6. Nondisclosure or misrepresentation in filling out applications of other university records.
7. Any action which may be deemed as unprofessional or inappropriate in the professional community of the discipline being studied.

Harassment/Discrimination

Texas A&M University-Kingsville does not tolerate discrimination on the basis of race, color, religion, national origin, age, disability, genetic information, gender, gender identify or sexual orientation (or any other illegal basis) and investigative processes are available for any reports that indicate sexual harassment, sex-based misconduct, harassment, or discrimination may have occurred by a respondent that has enrolled at or is employed with the university. Sexual harassment, sexual assault, dating violence, domestic violence, and stalking based on sex are types of sex discrimination. Such sexual misconduct is unacceptable and will not be tolerated. Any member of the university community violating this policy will be subject to disciplinary action. A person who believes they have been the victim of sexual harassment, sexual assault, dating violence, domestic violence, stalking based on sex or unlawful discrimination of a protected class may pursue either the informal or the formal complaint resolution processes. Reports may be initiated with the Office of Compliance at (361) 593-4758, with the complainant's immediate supervisor, a department head, a supervisory employee, any faculty or staff, or the Dean of Students at (361) 593-3606. Regardless of who the incident is reported to, the Compliance Office will be notified of the report so that they can reach out to the complainant to discuss supportive measures and administrative processes that may be available.

Please note, all faculty and staff are mandated reporters, except for counselors at Student Health and Wellness. Counselors at Student Health and Wellness are confidential reporters and will not disclose any identifiable information regarding an incident that is made known to them. However, they may be able to provide information on where supportive measures can be obtained and administrative processes initiated. A mandated reporter (any faculty and staff) is required to report any incident that is made known to them, while they are working within their job description, to the Office of Compliance, Lewis Hall, Suite 130, 361-593-4758, titleix@tamuk.edu. This includes incidents that have occurred on or off-campus. For those who wish to remain anonymous and are not reporting a mandated report, anonymous reporting is available at https://secure.ethicspoint.com/domain/media/en/gui/19681/index.html.

Pregnant and Parenting Students

Texas A&M University-Kingsville does not tolerate discrimination of pregnant or parenting students. Students who are pregnant or parenting may not be denied access to any program or activity on the basis of their pregnant or parenting status. Any pregnant students, or student planning on becoming pregnant, should consult their health care provider to determine what, if any, accommodations are needed, based on their individual situation. Temporary leave for pregnant or parenting students due to medical necessity may also be available. It is the responsibility of the student to communicate their needs to the faculty member or Office of Compliance as soon as possible in order for risk-reduction to be assessed and to determine if additional modifications for the course are necessary. While the university cannot mandate the disclosure of a student's status as pregnant or parenting, the university strongly recommends that students do provide notification, so appropriate steps can be taken to ensure the health of both the parent and child. To communicate health circumstances or to request additional information (accommodations, leave, lactation rooms, pregnancy parking permits, etc.), the following individuals may be contacted:

Pregnant Students:
Tasha Clark, Office of Compliance, Lewis Hall, Suite 130, 361-593-4758, TitleIX@tamuk.edu

Parenting Students:
Kirsten Company, Office of Dean of Students, MSUB 306, 361-593-3606, Kirsten.company@tamuk.edu

UNIVERSITY SUPPORT SERVICES

NAME	SERVICES	
Pathways Academic Assistance Center	• Tutoring and academic support, in-person and online • Peer Tutors help provide a solid academic foundation that enables students to become confident, capable, independent learners • Tutors guide students in identifying, acquiring, and enhancing the knowledge, skills, and attitudes needed to reach their desired goals	Location: Jernigan Library, 220 Phone: 361-593-5223 Email: paactutoring@tamuk.edu Website: PAAC Tutoring Appointments: javsuccess.tamuk.edu IG: tamuksuccess_squad
Writing Center	• Writing consultation in-person and online • Writing consultants assist students with writing assignments at any stage of the writing process: understanding assignments, brainstorming, drafting, revising, editing, researching, and integrating sources	Location: Jernigan Library, 217 Phone: 361-593-2744 Email: success@tamuk.edu Website: Writing Center
Success Peer Mentoring	• Mentors strive to increase students' connections with the university & Kingsville community • Mentors refer students to resources, including experiential learning opportunities (e.g., research, internships, global study, etc.) • Mentors facilitate student success strategies (e.g., time management, motivation, organization, healthy habits, study/test-taking, etc.)	Location: Jernigan Library, 210 & 242 Phone: 361-593-5800 Email: success@tamuk.edu Website: Success Mentoring
Jernigan Library	• Check out books, laptops, calculators, reserve materials and more. (https://libguides.tamuk.edu/access) • LibGuides provides information concerning online research help for a variety of subjects • Computer lab on the first floor • South Texas Archives on the third floor, houses archival materials documenting the rich history of both South Texas and the University	Location: 1050 N. University Blvd. Phone: 361-593-3319 Email: Ask Us! Website: Library

NAME	SERVICES	
Mental Health & Well-Being	• Provide students with essential knowledge and tools to understand and support mental health. • Personal counseling focuses on short-term treatment goals to facilitate adjustment, improve functioning, and address acute symptoms that may impede student success • U-Turn Program helps students identify their academic strengths and opportunities for growth • Next Steps Career Counseling Program assists students who are unsure of their major, career, or future goals/plans • After-hours crisis support through UPD 361.593.2611 • Access to Telus Health, a service available 24/7/365 via chat, phone, or webinar. Scan the QR code to download the app and explore the resources available for guidance and support whenever it is needed.	Location: 1210 N. Retama St. Phone: 361-593-5080 Email: counselingservices@tamuk.edu Website: Counseling Suicide & Crisis Lifeline: call/text 988 Telus app
Disability Resources	• Ensure equal access and full participation in the college experience and programs for students with disabilities • Facilitate reasonable academic accommodations for students on a case-by-case basis that aid in academic success	Location: 1210 N. Retama St. Phone: 361-593-3024 Email: drc.center@tamuk.edu Website: Disability Resource
Advising	• Advisors ensure students stay on track to meet their degree plan needs • Help students set and reach academic and personal career goals • Assists students in finding educational opportunities & campus resources	Location: Various Locations Phone: 361-593-3935 Email: success@tamuk.edu Website: Academic Advising
Career Engagement	• Resume reviews & practice interviews • Strategic career & alumni mentoring connections • Work study & on-campus job-finding assistance • Internships & full-time jobs in Javelina Careers powered by Handshake • Career Expos	Memorial Student Union Building (1050 W. Santa Gertrudis Ave.), 122 (across from Starbucks) Phone: 361-593-2217 Email: hirejavelinas@tamuk.edu Website: Career Engagement